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A METHODOLOGY TO ANALYZE FORECAST PROBLEMS.(U)
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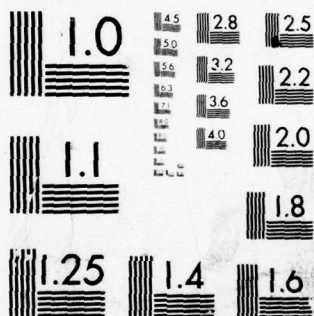


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A Methodology to Analyze Forecast Problems.

Technical note

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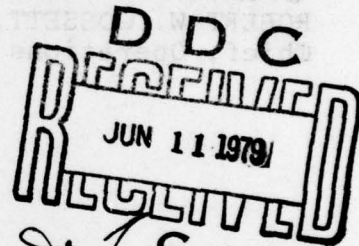
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This technical note has been reviewed and is approved for publication.

Robert W. Smith

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PREFACE

AWS forecasting units must have programs that routinely evaluate the quality of forecasts and local point warnings. Technical improvement programs are also needed to maintain and to improve the technical quality of forecast products. There are many factors which can contribute to a decline in forecast performance. Unit managers need to be able to define the causes of deteriorating performance and to implement necessary corrective actions. This technical note describes a methodology that unit managers can employ to define forecast problems, likely causes, and actions required to correct problems.

Phillip D. Wood

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Phillip D. Wood

PHILLIP D. WOOD, Major, USAF

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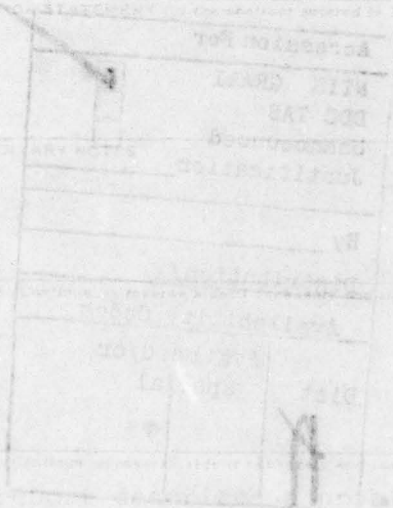
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I. INTRODUCTION

In 1976, 1WW/DON prepared a worksheet to use when preparing for Special Technical Consultant Visits (TCVs) to units with significant forecasting deficiencies. Prior to a visit to a unit, that unit was forwarded a Potential Problem Analysis Worksheet (see Figure 1). The unit was asked to complete and return the worksheet. The purpose of this was to help the unit and 1WW/DON better understand the nature and causes of the forecast problem. This action helped 1WW/DON decide how to prepare for the Special TCV and what assistance should be provided during the visit. The remainder of this technical note will describe a problem analysis methodology recommended for use by base^{station} managers whenever an adverse trend in forecast or local point warning performance is observed.

II. DESCRIPTION OF THE METHODOLOGY FOR ANALYZING FORECAST PROBLEMS

Deterioration in forecast or local point warning performance is normally detected through the local evaluation program or review of TAFVER summaries. Comparison of unit performance versus locally developed or higher headquarters prepared performance standards clearly reveals substandard performance and adverse trends. Corrective actions are often implemented with little thought given to clearly defining the problem, to listing possible causes, and to determining the most efficient way to correct the problem. Often we react based on intuition or gut feeling rather than intelligent, thoughtful evaluation of pertinent facts and factors. The reaction response frequently results in an immediate, temporary technical fix followed later by problem recurrence and another series of trial and error attempts to cure the problem. These type efforts are costly considering the man-hours misused. Fruitless and prolonged discussions at forecaster seminars frequently take place. These can leave participating forecasters aggravated and wondering why so much of their time was blown. Wasteful gathering of masses of data for forecast studies, etc., sometimes takes place in this reaction type of response to a deterioration in forecast performance. The impulse to attack a forecast problem, without first systematically evaluating the adverse performance trend, must be avoided.

The problem analysis methodology shown in Figure 2 is a way to replace intuitive problem solving with a more rigorous, systematic procedure.

The three bits of information at the top of Figure 2 are self explanatory.

POTENTIAL PROBLEM ANALYSIS WORKSHEET

Unit/Location: _____ Date of Analysis: _____

*** 1. PROBLEM DEFINITION:**

3, 6, 12, 24, All Hours _____
Seasonal _____
Cig/Vsby _____
Optimism/Pessimism _____
TRW, RASH, FG, K, Haze, Etc. _____
TAF vs Persistence _____
TAF vs CC _____
Trends _____
Which Categories _____
What Verification Times (Local) _____
OEP _____
PEP _____
LAP _____
OESE _____
Manning Shortage _____
 Leaves _____
 TDY _____
 Not Enough Assigned _____
New Personnel _____
 Training _____
 Experience _____
 Time-on-Station _____
All Forecasters _____
Radar Available/Used _____
Climo Data Available/Used _____
Satellite Data Available/Used _____
Rawinsonde Data Available/Used _____
Too Many Visitors _____
Abnormal Weather _____
Implemented New Program _____
Workload Changes _____
TAF Worksheet _____
Incorporation of All Data _____
Tech Studies Available/Used _____
ROT Available/Used _____
Forecaster Seminar _____
Self Inspection _____

***/** 2. PROBLEM STATEMENT:**

**** 3. POSSIBLE CAUSES:**

**** 4. POSSIBLE REMEDIAL ACTION(s):**

**** 5. TECHNICAL CONSULTANT RECOMMENDATIONS OR HIGHER HEADQUARTERS ASSISTANCE REQUIRED:**

* Based on entries in Item 1, describe what the problem is and when it began and summarize contributing factors.

** If insufficient space is provided for an entry, use an attachment.

Figure 1. Example of Potential Problem Analysis Worksheet

PROBLEM ANALYSIS WORKSHEET

Unit/Location: _____ Date of Analysis: _____ Analyst: _____

REASON FOR ANALYSIS: (Explain in terms of when problem began and trend of deviation from a performance standard)

PROBLEM DEFINITION: (Line through with pencil those items that do not help define problem; circle those items that do)

Which

Local Product	Time	Trend	Cate-gories	Phenomenon	People	Guidance	Other	Sum-mary
TAF	Summer	Optimistic	A	Ceiling	Not Enough	New Procedures	_____	_____
LPW	Winter	Pessimistic	B	Visibility	New	New Program	_____	_____
Met Watch	Fall	Constant	C	Thunderstorms	Inexperienced	Revised Instructions	_____	_____
OPVER Fcst	Spring	2 Cat Misses	D	Rainshowers	Too Many Visitors	Forecast Techniques	_____	_____
_____	3 Hr Fcst	1 Cat Misses	_____	Fog	Too Much Leave	_____	_____	_____
_____	6 Hr Fcst	_____	_____	Smoke	Too Much TDY	_____	_____	_____
_____	12 Hr Fcst	_____	_____	_____	Workload Changes	_____	_____	_____
_____	24 Hr Fcst	_____	_____	_____	New Section Ch	_____	_____	_____
_____	Morning	_____	_____	_____	New Commander	_____	_____	_____
_____	Afternoon	_____	_____	_____	_____	_____	_____	_____
_____	Night	_____	_____	_____	_____	_____	_____	_____
_____	Sunrise	_____	_____	_____	_____	_____	_____	_____
_____	Sunset	_____	_____	_____	_____	_____	_____	_____
_____	Verification	_____	_____	_____	_____	_____	_____	_____
_____	Hr	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____

PROBLEM STATEMENT:

IMPACT TO CUSTOMER: (Look at Section B of your TFRN)

EVALUATE USE OR VALUE OF: (Describe ways to improve use or enhance value, if any)

Centralized Products
Local Analysis Program
Forecast Preparation Procedures
Forecast Preparation Worksheet
Radar
Satellite Data
Upper Air Data
Integration of All Data
Forecaster Discussions
Forecast Studies
Rules of Thumb
Climo Data
Case Studies
Bust Reviews
Unit Seminars
Higher HQ Seminars
TFRN
TFRF

PROBLEM CAUSES: (Describe possible and most probable)

RECOMMENDED CORRECTIVE ACTIONS:

PLANNED IMPLEMENTATION DATE: ACTUAL IMPLEMENTATION DATE:

RESULTS:

Figure 2. Example of Problem Analysis Worksheet

In documenting the "Reason for Analysis," the problem analysis will get off to a proper start if specifics can be determined and recorded. The specifics should include such things as the date or time the problem began and verification statistics that objectively show the current level and trend of the substandard performance.

In the "Problem Definition" section, you could line through those items that do not help define the problem. We suggest use of a pencil because later in the analysis you may determine that problem definition is incomplete. Blanks were purposely left below each column so you can add any items needed to help define the problem. In the far right column entitled "Summary" we recommend you write in all the items not lined through. The problem definition step will help you identify what the problem is and is not.

After completing the "Problem Definition," you should be ready to write the "Problem Statement." The problem statement should be a concisely worded statement summarizing the things that were identified in the problem definition step.

In the "Impact to Customer" section you should state how the defined problem is affecting customer missions. In Section B of your terminal forecast reference notebook (TFRN) you may have information that will give you thoughts on what to enter in this section of the problem analysis worksheet. In Section B of your TFRN all customer activities significantly affected by weather should be discussed along with customer actions that occur whenever significant weather criteria are actually exceeded or forecast to be exceeded. Also, the costs to the supported organization when adverse weather occurs should also be specified. The reason for this step in the problem analysis is to make you assess the impact to the customer associated with this particular forecast problem.

With the resource limitations that exist in base weather stations and elsewhere, we must devote available time and expertise to the most important forecast problems. For this reason, we should assign priorities to forecast problems in a way similar to the duty priority lists that are posted behind the briefing counter. We simply do not have the time and resources to attack all problems. We must be selective and choose to work on those that impact customers the most (i.e., are the most costly in terms of mission degradation and/or misuse of available flying hours, etc. These thoughts dovetail with the policy statement in AWSR 80-3 which indicates that technical improvement efforts of units with a local forecasting function must be directed toward forecast requirements which impact supported customers operations.

In the next part of the analysis we encourage your evaluation of the use of a number of things that are important in the forecast preparation routine. Evaluation of the use or value of each thing listed should be in terms of what the problem is. In other words, for each entry in the "Problem Definition" section in the column headed "Summary," consider whether and how centralized products or the manner in which they are locally processed and used may have caused the problem. Then describe ways to improve the use or value of centralized products. By doing this, you have begun to list things that should be done to correct the problem. After completing that action, then consider whether and how the local analysis program or any local analysis procedure deficiencies contributed to the entries in the "Problem Definition" section. Repeat the other actions described above. Again space is left under the section entitled "Evaluate Use or Value Of" for you to add important items we may have overlooked. This will be one of the more difficult sections of the problem analysis to complete. Meticulous attention to this section will enable you to uncover the most likely causes of the forecast problem.

In the "Problem Causes" section, the reason we call for documentation of the "possible" and "most probable" causes of the problem is because we don't want you to discard a "possible cause" that after additional thought and analysis, could turn out to be one of the "most probable" causes.

After stating or listing the "Problem Causes," describe those actions necessary to correct the current situation and reduce the possibility it may recur. You should have determined all the required corrective actions in the "Evaluate Use or Value Of" section. If possible, list the required actions in order of importance. It's appropriate at this time to think about who will be responsible for implementing each action and when. Progress reports should be prepared on a periodic basis to determine the timeliness and appropriateness of corrective actions. If progress is unsatisfactory, the previously completed problem analysis worksheet should be reviewed to see if any of the analysis was erroneous. Progress reports could be prepared in memorandum format and attached to the problem analysis worksheet. The overall "Results" of the corrective actions taken should be recorded when all actions have been taken. The analysis and progress report should be retained in case the problem raises its ugly head again sometime in the future.

We won't be offended if you don't implement this problem analysis methodology when a decline in forecast performance occurs at your unit. Our main purpose for this technical note is to encourage you to organize your thought process when you accomplish an analysis of a forecast problem. The next time you are confronted with a forecast problem, pull this technical note from the dusty corner of your terminal forecast reference

file bookcase. If you choose not to apply the problem analysis methodology we have described, at least structure your thinking so you can logically derive prudent decisions. If this technical note helped you in any way to do this, the effort to prepare this document was well worth it.

